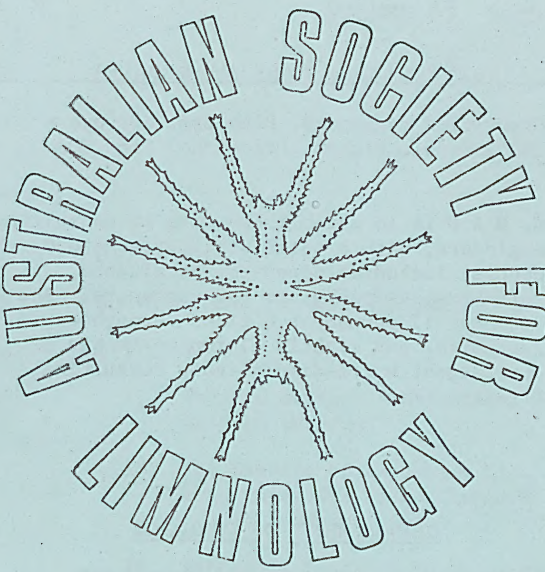

NEWSLETTER

PRIVATE CIRCULATION VOLUME 13 NUMBER 1 WINTER 1975

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DEPARTMENT OF ZOOLOGY

University of Adelaide, G.P.O. Box 498,
Adelaide, S.A. 5001.

AUSTRALIAN SOCIETY FOR LIMNOLOGY
NEWSLETTER

VOLUME 13 NUMBER 1 WINTER 1975

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THE NEWSLETTER IS NOT A FORMAL PUBLICATION AND ANY MATERIAL IN IT SHOULD NOT BE CITED WITHOUT PERMISSION OF THE AUTHOR(S) CONCERNED

THE AUSTRALIAN SOCIETY FOR LIMNOLOGY

The Australian Society for Limnology is an association of over 200 people with professional or amateur interests relating to Australian inland waters. Since its inception in 1961, the Society has played an important role in fostering limnological work in this country. The ASL also promotes liaison between limnologists in academic, private, and governmental institutions, and has a vested interest in the conservation of aquatic and related resources. Annual congresses are held near centres of limnological interest, and the program includes scientific sessions, field excursion, and social activities.

The ASL publishes a Bulletin, containing scientific articles, a Newsletter, with notes on activities, articles of general interest, book reviews, and congress announcements, and also an occasional Special Publication. A further periodical publication is the Directory of Australian Limnologists.

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* * * * * *

Newsletter contributions are always welcome, and correspondence should be addressed to the Newsletter Editor. The next copy deadline is 1 November, 1975.

EDITORIAL

TO WHOM IT MAY CONCERN

It is many years since I had the privilege of editing the Society's Newsletter, and I had great thoughts of putting my trained and powerful mind to work to compose an editorial which would worthily mark my entry into the stratosphere. However, *Nature, Lond.* recently had an editorial which, I grudgingly concede, is better than any I could have written. It is reproduced below in place of my own. In reproducing it, full acknowledgement is given to the Editor of *Nature, London* for permission to reproduce. The editorial appeared in *Nature, Lond.* 254, p. 469, April 10, 1975. And if the shoe fits .....

"The work reported in this paper was supported by the Science Research Council who paid £15,000 for a project, the title of which can only be said to bear a remote resemblance to the title of this paper. This money paid for a highly sophisticated microscope which turned out to be unnecessary, a digitiser of a type which it later transpired was possessed by many other laboratories within walking distance, a chart recorder which has been useful on a couple of occasions, a trip to America to give a ten-minute lecture at 8.20 on the first day of a conference, numerous train journeys to London to attend committee meetings the value of which the entire committee agrees privately is nil and a research assistant whose use has been minimal but whom the professor could find nobody else able to pay for.

Capital facilities were provided by the University Grants Committee and include my large office and personal laboratory which unfortunately remained empty during my sabbatical year.

I thank my research students who, initially unable to see the point of my work, are now unable to see the point of anyone else's. I appreciate their good-humoured forbearance whilst I wrote their theses for them, persuaded the examiners that this was a significant contribution to knowledge and set them up in university careers of their own despite their initial belief that they could be more productive in industry.

I thank my secretary for patiently retyping this manuscript in its entirety several times when I have discovered grammatical and punctuation errors. Her cheerfulness in re-making forty photocopies of the manuscript and dispatching them each time by air mail to my friends and enemies is acknowledged. Her skill in finding things to do during my sabbatical absence is also appreciated. Admittedly the absence was mitigated by her being able to type my book, for which I shall receive a modest royalty, and being able to look after my other private business interests for which the facilities of the department are occasionally most helpful.

I thank my wife for acting as laboratory assistant. Her initial untutored clumsiness did not deter her from continuing to try hard. She was particularly helpful as my personal assistant on my trip to America.

The computational work described in the paper was done at the University Computer Centre whose staff I thank for their courtesy in helping me debug the program and in carrying over my paper output to me every day. They may be reassured that their work was not in vain - the final results agreed perfectly with predictions based on my pocket calculator. Although the amount of printing on each page of my output may have seemed to them somewhat slight, the paper is being put to good use for crayonning in my son's nursery school.

I thank the departmental tea-lady who never forgets to acquire, during her lunch break, a large cream bun which I particularly like to have delivered to my office with my cup of tea at four o'clock.

The equipment used in the experiments reported in this paper will not, as far as I can see, be used by me again. Nevertheless, I cannot, alas, see my way to letting anyone else use it, as it has certain characteristics which might confuse other users and there is always the possibility of damage. Likewise although the data which I have amassed is by no means completely described in this paper, I do intend some day to look once again at these results. In the meantime it would be inappropriate for anyone else to attempt to set up similar experiments; I am perfectly happy to share my unworked data with anyone. But I must point out that the information on the magnetic tapes is not self-evident, so anyone wishing to share would do well to visit my laboratory - I would happily co-author any paper that emerged from such a visit.

Finally, I must say something about this idea of accountability in science which some people are talking about these days. The thought that a researcher at the frontiers of knowledge should be spending the government's money and his own and his students' time other than in an efficient and conscientious way is quite alien to me and contrary to the spirit of academic freedon. I know I give value for money in my research and I need no small-minded bureaucrat telling me how to cut costs - besides 'value for money' is mercifully indefinable in the world of pure research. Yet, for what it's worth, I am prepared to say that I have rigorously observed the government's energy conservation measures. To conserve electricity, nobody on this project has been allowed to work in the laboratory during the hours of darkness. This has, of course, somewhat affected our productivity, but it reflects my concern that at a time like this we should not waste the nation's resources."

FURTHER NEWS OF XIV CONGRESS

The following pages contain abstracts of papers read at the recent Congress. They are reproduced here for two main reasons: (a) they will fill up the Newsletter; (b) if readers behave similarly to the Editor, loose papers eventually end up in the waste basket, whereas important booklets like the present have a reasonable chance of survival. No abstracts are available for the papers delivered by Dr. G. Ganf (Univ. of Adelaide) or Dr. B. Hart (Caulfield Tech.).

AUSTRALIAN SOCIETY FOR LIMNOLOGY CONGRESS, CANBERRA, 1975

ABSTRACTS OF PAPERS

SOME BIOLOGICAL CONSIDERATIONS OF THE PURARI RIVER SCHEME (PAPUA NEW GUINEA)

Dr. T. Petr, Zoology Department, Monash University

The Purari River in Papua has a vast hydroelectric power potential currently estimated at about 10000 MW. It is proposed to dam this river and its tributaries at 10 sites. Engineering and environmental feasibility studies are expected to provide the necessary information for the final decision on the construction of the first dam at Wabo. The area of the future lake is covered by tropical rain forest, and has a low human population. At present little information is available about the limnology of the river and the delta. Collections of aquatic organisms have commenced, and they indicate that the fish stock is predominantly of marine origin. The invertebrate fauna is almost unknown. The drawdown of 25 metres, with quick changes from high to low water level and vice versa, will result in the absence of littoral in this lake, and will have a negative effect on its fish. The Purari is highly turbid; the biological significance of the suspended sediments is not known. The deposition of sediments in the lake may have an unfavourable effect on organisms of the delta and the sea, and lead to an increased erosion of the delta by sea current.

* * * * *

A LIMNOLOGICAL SURVEY OF THE VESTFOLD HILLS, ANTARCTICA

Burton, H. and Williams, R., Antarctic Division, Department of Science, Melbourne

The Vestfold Hills is an icefree area of some 400 sq. kms. centred on Davis (63°35'S, 78°50'E) which is studded with lakes and tarns. These lakes range in salinity from very fresh lakes which are ice-covered for most of the year to lakes approximately 8 times that of sea water which do not freeze even in winter when temperatures reach as low as -20°. This communication presents some results of a reconnaissance survey encompassing more than 50 of these lakes with reports on their physical and chemical properties and biota.

* * * * *

ESTIMATES OF THE PRODUCTION OF THE BRINE SHRIMP *(PARARTEMIA ZIETZIANA)* IN TWO HYPERSALINE LAKES

R. Marchant, Zoology Department, University of Adelaide

From July 1973 to March 1975 quantitative samples have been taken of the *P. zietziana* populations in two hypersaline lakes near Colac, Victoria. From the data I have calculated population sizes per square metre and have been able to measure growth of the various cohorts that are distinguishable. For most of the year there is only one cohort and this can be followed from birth to death quite easily in the samples. Production is calculated by integrating a plot of the number of individuals per sample against mean individual weight per sample. The lake with the highest average biomass of the two has a shrimp production of roughly 10g dry weight per square metre per year.

* * * * *

ENDEMIC ELEMENT OF TASMANIAN TRICHOPTERA

Arturs Neboiss, Curator of Insects, National Museum of Victoria, Melbourne

A revision of Tasmanian Trichoptera, based on material collected during 1965-74 period is now in progress and preliminary information indicates that the number of species known from this region will increase from 85 to more than 150.

For the analysis of distribution and endemic content of Tasmanian Trichoptera the island is subdivided into six provinces. The subdivision is based on a combination of landforms, vegetation and climate (temperature, rainfall, etc.). A preliminary count of species known to be endemic indicates that there are about 105 or 69% in this category. This figure is quite close to that found in some other insect orders. As yet it is impossible to finalize any figures because the Australian mainland fauna, particularly that of Victoria, has not been sufficiently investigated.

From the data on distribution it becomes obvious that there are certain areas with large numbers of endemic species, whereas in others the proportion appeared somewhat smaller. Not all provinces have been sampled equally thoroughly, but even so, there is an obvious, quite definite trend. The analysis of recently collected material, to which the information from earlier publications has been added, clearly shows that the Western Province and the Central plateau have the highest proportion, about 75%, of endemic species, decreasing in the eastern provinces to 50% or even less.

* * * * *

THE ZOOGEOGRAPHY OF THE OSTRACODES ENDEMIC TO AUSTRALIA AND BELONGING TO THE TRIBE MYTILOCYPRIDINI (FAMILY: CYPRIDINAE)

Patrick De Deckker, Department of Geology, University of Newcastle

Australocypris, *Mytilocypris* and at least 2 other genera can tolerate waters of wide ranging salinity (some species tolerate up to 112.5‰ salinity). These "giant" ostracodes are recorded in most parts of Australia, except in the centre and the northern part of the continent. It is suggested that their dispersal could be caused by some of the continuously migrating waterfowl (often seen habiting brackish waters) carrying ostracodes and ostracode eggs.

* * * * *

SOME ADAPTATIONS OF AUSTRALIAN FRESHWATER TURTLES

Bruce C. Chessman, Department of Zoology, Monash University

Freshwater turtles are frequently neglected in synecological limnological studies and surveys. However, they may in some habitats represent the major or only macroconsumer present. The biology of the three species occurring in the Murray-Darling drainage basin (the snake-necked tortoise *Chelodina longicollis*, the broad-shelled tortoise *Chelodina expansa*, and the short-necked tortoise *Emydura macquarii*) will be briefly discussed, including an outline of distribution, habitat, food and temperature-activity relationships.

* * * * *

FISH AND THE POLLUTED FINNISS RIVER

N.J. Williams, Australian Atomic Energy Commission, Lucas Heights, N.S.W.

The Finniss River of the Northern Territory receives, during the Wet and early Dry, a pollutant load of metals and acid from the mined area of Rum Jungle. Copper is probably the principal pollutant.

Four field trips from 1973 to 1974 yielded fish, invertebrate, and water samples.

The fish fauna comprises about 22 species. These were sampled or observed by three main methods: enmeshing in nets, poisoning using insecticides, and spotlighting at night.

The seasonal East Branch, which includes Rum Jungle in its catchment, has suffered damage to its banks and fringing vegetation as well as to its aquatic fauna. Fish occurred only at exceptional localities. The only clear damage to the perennial Finniss River was to its fauna. For 15 km downstream from its confluence with the East Branch there were marked reductions in the numbers of fish and crustacean species present, and in their apparent abundances. After a further 15 km the variety of species increased almost to that found upstream of the confluence with the East Branch.

* * * * *

LIMNOLOGY IN THE KITCHEN SINK

P. Tyler, Botany Department, University of Tasmania

A simple kitchen lake is described together with the results obtained.

* * * * *

STUDIES ON A RECYCLED RIVER

Barbara Bowles, State Rivers and Water Supply Commission, Victoria

It has been estimated that the River Thames has been drunk five times before it reaches the intakes of London's reservoirs. As the usual nutrient limitations are not found under these conditions, other limiting factors can be understood more clearly.

* * * * *

ECOLOGICAL STUDY OF THE MURRAY RIVER IN RELATION TO ALBURY/WODONGA

R. Croome and T. Hillman, Albury/Wodonga Development Corporation

Results will be presented of the study carried out to investigate the likely effects of the Murray River of a rapidly developing growth centre at Albury/Wodonga.

* * * * *

DEVELOPMENT OF EUTROPHICATION STUDIES IN AUSTRALIA

Ian C. Smalls, Metropolitan Water, Sewerage and Drainage Board, Sydney

An outline of current eutrophication studies in Australia, including details of Australian involvement in the OECD eutrophication program.

* * * * *

LIMNOLOGY IN NORTH QUEENSLAND

Richard G. Pearson, Department of Zoology, James Cook University, Queensland.

This paper presents:

1. a description of some of the inland waters of North Queensland;
2. a brief review of the status of limnological research in the area;
3. preliminary results of some current limnological studies.

Attention is drawn to the wide opportunities for limnological research in North Queensland.

* * * * *

A LIMNOLOGICAL SURVEY OF THE NELSON-BRIDGEWATER LAKES, VICTORIA

B.V. Timms, Science Department, Avondale College, N.S.W.

To the west of Portland there are a number of small lakes lying on coastal calcareous dunes. TDS values are around 500 ppm, pH is near 8 and water is typically dominated by Na^{+} and Cl^{-} ions, though the proportions of Ca^{++}, Mg^{++} and HCO_3^{-} are high. The common dune zooplankton *Calamoecia tasmanica* is restricted to Swan Lake; in the other lakes zooplankton is sparse or dominated by *Sulcanus conflictus* and *Gladioferens spinosus*, both of marine ancestry. The benthos of Lake Bong Bong and the

Main Bridgewater Lake is of low diversity but significantly includes two 'marine' species - the polychaete *Boccardia* and the crab *Halicarcinus lacustris*. The presence of these four species, together with geomorphological evidence, suggests a marine origin for these and other lakes, but not for Swan Lake. It shows some similarities to dune lakes on the east coast of Australia.

RECENTLY HEARD AT THE OFFICES OF A WELL-KNOWN WATER-SUPPLY AUTHORITY

CUSTOMER: I want to complain about this water . . . there's something wriggling around in it.

WATER-SUPPLY OFFICER: If the water was bad, it wouldn't be wriggling . . . it would be dead.

PACIFIC SCIENCE ASSOCIATION

THIRTEENTH SCIENCE CONGRESS

REPORT OF THE STANDING COMMITTEE ON FRESHWATER SCIENCE, 1972-1975

CHAIRMAN: Dr. G.R. Fish, Fisheries Research Division, Rotorua, New Zealand.

The main task discharged by the present committee has been a watching brief on the progress and status of freshwater science over the region. It was accepted during an early exchange of views by correspondence, that all reports would be biassed through the particular interests of the various members. No great effort has been made to widen our field of surveillance beyond our professional interests for it was felt that such limitation of members' reports provided added reliability to them which more than offset any omissions in the reviewing.

The Committee has borne this point in mind but even so, considers that the development and progress of freshwater science is far too uneven throughout the region. In some instances it is clear that the basic resources of the country are limiting. In most of the Pacific Islands, for example, not only are the freshwater resources meagre but the economy of the island is also such that the available technical effort is largely diverted towards investigation of the marine habitat, their freshwaters being considered important mainly as a medium for fish culture. Even this aspect may be changing for there is a trend that is well marked in salmonid culture elsewhere and present in the culture of other species too, for increased farming of marine and estuarine waters rather than of freshwaters. This trend, together with any increasing value of terrestrial agriculture, as may well be the case in countries such as Taiwan, reduces the commercial importance of freshwaters and may adversely affect the development of the resource as a whole. It is likely that a survey of all freshwaters in this general area would be of value to assist in well-considered development for as the local populations grow, so will their use of the available freshwaters change and increase. Care must be taken to ensure that water resources as are available, are not impaired through short-term exploitation for future use.

On the other hand, where the study of freshwaters is proceeding most satisfactorily - Canada probably stands out in this respect - such progress does not seem to be wholly a result of an ample national water resource. In the past, freshwater research has been largely developed through university studies but present day costs of adequate investigation are such that continued expansion of the research effort can only be maintained through the support of local and central government agencies. We consider that much of the value of the successful International Biological Programme has been through its involvement of central government resources to promote many of the projects completed in freshwater research.

Whilst the suggestions for future developments of national freshwater research, as indicated in the individual reports of our members, should receive the careful consideration and support of the Freshwater Sciences Committee, additional attention could profitably be given to projects likely to require the involvement of government as well as university and other agencies. A possible project of this type could be a monitoring of the quality of atmospheric precipitation. The source of all freshwaters is ultimately from the atmosphere and the effects of its pollution through varied emissions from industrial and other developments in one area, may be found in precipitation many hundreds of miles away. The study and care of this source is therefore of major national and international importance. Excellent progress in the study of precipitation water quality has been made in some countries, notably the United States of America, but more encouragement is needed in many countries elsewhere before progress in this research field can be considered as satisfactory.

MEMBERSHIP: FRESHWATER SCIENCES COMMITTEE, 1972-75

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PARISIANS RAVE ABOUT OUR YABBIES

THE AUSTRALIAN, Tuesday June 17 1975 - 3

Frogs legs and snails are not enough for Parisian gourmets: the latest craze is Australian yabbies.

They are being shipped live out of Adelaide in special wet packs at the rate of three tonnes a week.

Mr. Odd Boegh, South Australian manager of LEP Air Services Pty. Ltd., said his company was finding it difficult to keep up with the demand.

"The weather here is bad and our fishermen are not bringing in big hauls," he said.

"We sent five shipments over as an experiment and they sold so well we now have a contract with the Parish fish markets.

"Our biggest problem was finding a direct flight from Adelaide to Paris. The French like to buy the yabbies (freshwater crayfish) live so they can cook them as they like."

Mr. Boegh began exporting frozen yabbies last year when a Yugoslav businessman told him they were considered a delicacy in Scandinavia.

He said supplies would increase greatly in summer when yabbies were more prolific.

18.4.75 THE DANGERS OF EXPORTING LIVE "YABBIES", FRESHWATER CRAYFISH *(Cherax destructor)* .....

I.L. Carstairs,
Freshwater Crayfish Farmer & Consultant.

(P.O. Box 103, Kyneton, Vic., 3444.
Tel. 054 239140)

INTRODUCTION

It has recently come to my notice that some Australian fishfarmers and exporters are air-freighting live "yabbies" *(Cherax destructor)*, overseas.

At the moment the Australian Departments of Agriculture, Health and State Fisheries Departments in Victoria, New South Wales, Queensland South Australia and Northern Territory sanction this export. In Western Australia and Tasmania the export of live freshwater crayfish is banned in order to protect commercial and wild resources.

DEVELOPING EXPORT INDUSTRY IN JEOPARDY

The new and promising export industry for processed "yabbies", *(Cherax destructor)*, is being placed at risk by the export of live freshwater crayfish from Australia.

I have recently been approached by a N.S.W. fish-farmer who is concerned that his buyers would breed from the live *Cherax destructor* that he was legally exporting. He wanted to know if there was any method of sexually sterilising the animals.

There is a high risk of *Cherax destructor* breeding in other countries. I have seen them successfully bred near Seattle, North America, and in a warmer climate it is likely that they would soon reach plague proportions. The North American crayfish, *Procambarus clarkii*, was introduced near Osaka, Japan, in 1918. By 1951, this species (at densities of 2,600 kg/hectare) was causing serious damage to young rice shoots (La Caze, 1966).

Like the European carp, once introduced, it is not economically feasible to exterminate freshwater crayfish.

NATIVE AGRICULTURE AND FISHFARMING AT RISK

There is the possibility that *Cherax destructor* will not eat young rice shoots, but its burrowing habit is likely to disrupt dramatically, local agriculture. Fish, taro and rice farming are at risk on account of freshwater crayfish burrowing through bunds and pond walls (Brock, 1960).

LAKE FISH HARVEST REDUCED

Introduced *Procambarus clarkii* were responsible for the drastic reduction of the fish harvest from several deep lakes in Central Africa (Hobbs, 1974).

It was "hoped" (against the advice of Dr. Hobbs), that the crayfish would consume the water snail that hosts a stage of *Bilharzia* disease.

Instead, the *Procambarus* drastically reduced the fish harvest from the lakes by consuming the peripheral weed shelter and fish eggs (Hobbs, 1974).

In Africa, the severe reduction of a high protein crop causes malnutrition and a dramatic rise in human death-rate.

PATHOLOGY

Over the past three years, I have been studying the pathology of *Cherax destructor* as part of my research into the experimental farming of these animals.

(1) BLACK SPOT DISEASE - Little is known about this disease in Australia, and I am attempting to culture and identify the organism responsible. It is likely to be related to the "burn spot" disease common on the European *Astacus astacus*. The causative fungus in this case was *Ramularia astaci* (Unestam, 1973). Other fungi imperfecti have been found on *Astacus leptodactylus* in Europe, and the North American *Orconectes limosus*. In these cases the normal crayfish population was "often considerably reduced" (Unestam, 1973).

(2) OSTRACODS - Again little is known of the effect of commensal and parasitic ostracods on Australian freshwater crayfish populations. Ostracods are known to be fatal to individual crayfish (Riek, 1974).

(3) TEMNOCEPHALIDS - In addition to these diseases and parasites, ectocommensal Temnocephalids frequently infest *Cherax destructor*. I have observed physical obstruction of the crayfish gills by the eggs of these flatworms.

(4) FISH DISEASE VECTOR - Freshwater crayfish are well-known scavengers of dead fish. Infectious pancreatic necrosis and infectious hematopoietic necrosis are just two examples of salmonid fish diseases in Europe where freshwater crayfish are suspected mechanical vectors (Unestam, 1974; also Vey and Vago, 1973). The fact that *Cherax destructor* is amphibious, and can crawl considerable distances through damp vegetation, gives it great potential as a fish disease vector, travelling between river and fishpond systems.

EXTENT OF DAMAGE

Live, North American freshwater crayfish have been introduced to Europe, Japan, Central Africa and Hawaii. In no case has the introduction benefited the recipient country (Unestam, 1974).

EUROPE - The plague fungus *(Aphanomyces astaci)*, carried by introduced crayfish, has decimated the valuable, local *Astacus astacus* population (Goldman, 1973). No resistance to this disease has been developed in the 50 years since its introduction (Unestam, 1974).

JAPAN - *Procambarus clarkii* reached plague proportions of 2,600kg/hectare, becoming a pest by eating young rice shoots (La Caze, 1966).

CENTRAL AFRICA - *Procambarus clarkii* caused drastic decline in lake fish harvests by eating peripheral weed shelter and fish eggs (Hobbs, 1974).

HAWAII - *Procambarus clarkii* burrowed through dikes, becoming a pest in taro cultivation (Brock, 1960).

THE RISKS

It only needs one pair of live, exported *Cherax destructor* to be thrown carelessly into a foreign pond or river to change radically the ecology and economy of a continent.

The burrowing and eating habits of the *Cherax* themselves could cause drastic ecological change. The accompanying ostracods, black spot disease, Temnocephalids, Filamentous algae, not to mention the seeds of noxious weeds and forms of fish disease organism in the crayfish could also present dangerous problems by spreading rapidly.

ACTION REQUIRED

It is up to the relevant Government Departments to decide from this data, what action will be taken to halt this trade in a potential pest to other continents.

I feel that responsible guidelines should be laid down to protect our processed *Cherax* export market. This would also ensure that Australia does not find itself in the ironical position of being approached for foreign aid following the collapse of a vital food industry overseas as a result of the live export of *Cherax destructor*.

The reaction I have had from various Government Departments has frequently been "We shall prevent live imports of freshwater crayfish to Australia, but it is up to other countries to prevent the entry of our live freshwater crayfish".

The reason for their parochial indifference, I charitably lay down to ignorance of the risks involved.

ROUTINE EXAMINATION INADEQUATE

Another complicating factor is that in the opinion of Professor Unestam "a certificate from veterinary routine labs. stating freedom from dangerous parasites in examined crayfish is of little value since no general methods exist which can detect specialized parasitic bacteria, fungi and viruses". Also, once established, it is virtually impossible to eradicate *Cherax destructor*.

I am working on a scheme to increase the per capita fish consumption in selected areas in Asia, using native fish and crustacean species.

I was strongly tempted to introduce *Cherax destructor* to these areas myself until I had met prominent fish pathologists, biologists and ecologists in eighteen countries on a recent Export Development Grant trip.

Now I am fighting to prevent what I am convinced would be a disastrous introduction, from every angle.

I feel strongly that it is my duty to inform the relevant Australian authorities that sending live *Cherax destructor* to other countries is totally irresponsible and equivalent to sending live lamprey to Canada, or live rabbits to Australia.

I would like to see a ban on the export of live freshwater crayfish put into force immediately, pending investigations of the inherent dangers involved in such export.

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FISHERIES RESEARCH IN UNIVERSITIES

- A CASE FOR GREATER INVOLVEMENT

The following article was prepared by Dr. R.C.L. Hudson, University of Melbourne, in connection with a proposal not concerning the A.S.L. However, its message is not without some interest to A.S.L. members. Dr. Hudson is thanked for permission to reproduce it here.

Fisheries research has long been considered the prerogative of large Commonwealth and State institutions and consequently has become synonymous with directed applied research into commercially exploited fish populations, and the development of aquatic food resources. In that sense the areas of research have largely been determined by the immediate needs of the fishing industry and have therefore devolved around, for example, physical and chemical oceanography, stock assessment and mangement, plankton ecology, exploratory fishing, gear design and operation, preservation, processing, marketing, economic aspects, and conservative legislation. In its broader sense, however, fisheries research also includes such areas as taxonomy, basic biology, behaviour, physiology, social interrelations, population dynamics, and the construction and testing of predictive models for exploited and unexploited species. These latter areas of research within the broader meaning of "fisheries research" while being recognised receive little support and do not form a significant part of the research effort in either Federal or State organisations by reason of their charter and established priorities. However, a basic knowledge of the biology of a species whether exploited or not and an understanding of broad ecological principles is clearly essential for the proper management of commercial fish stocks, the efficiency of fishing, and the development of new fisheries. Research into sensory physiology, swimming energetics, social behaviour, population structures, the effect of pollutants, and so on ultimately relate to the broader aspects of the biology and survival of fisheries. Fisheries research in the traditional narrow sense requires expensive logistic support which can only be provided by large institutions making full use of such facilities. It is therefore in the fundamental areas in the broader sense that Universities can make a major contribution to fisheries research.

Most Universities are involved to varying degrees with research and teaching in marine biology. The James Cook, Melbourne, New England, Sydney, Tasmania and Western Australian Universities, have large commitments in this field. The amount of research carried out in the Universities involving fish that is directly related to fisheries research in the narrow sense is small. Research that is more nearly equivalent to this is carried out in Tasmania, and from the Zoology Department in Western Australia in successful collaboration with CSIRO and State Fisheries maintained over several years. This collaboration is continuing with the sort of topics that can be handled within the research budget of the Department. These topics are necessarily confined to near-shore and estuarine species that may be fished commercially. The present approach is to train students in the skills and techniques relevant to commercial fish stocks, and to provide a thorough understanding of how ecological principles can be applied to fisheries research.

Fish feature in the research topics of a number of workers throughout the country. The nature of these topics accords more closely to the broader concept of fisheries research and involves investigations into taxonomy, basic biology, behaviour, physiology, pollution, and so on. However, the number of such projects is relatively small and those involved appear in some cases unaware of the relevance of their work to fisheries. In some cases, of course, the projects bear little relation to fisheries research.

Several topics on fresh-water fishes have been carried out in recent years but there now appears to be only one person with any experience in this area and he is about to start work in impounded catchment areas. Grave concern has been expressed that so little attention has been paid to the inland lakes and waterways of Australia.

Most University Biological Departments indicate that at the present time expansion within the area of fisheries research and fish biology is generally slow or absent, except possibly as part of a general increase in marine biological research programmes. Several Departments plan to develop fisheries research as part of their Ecology studies.

The research capacity of Universities, the academic freedom to pursue topics of interest, the wide range of expertise, the availability of a range of sophisticated experimental apparatus, and the multi-disciplinary exchange of ideas put Universities in a unique position to undertake research into fundamental problems and new unexplored areas. It is self-evident that staff actively involved in research are better able to train students at the forefront of techniques and knowledge. Thus, Universities can provide a facility that is unparalleled for both research and training in fisheries. The nature of this research and the training provided would be different to those currently undertaken in fisheries institutions and would have the promise of introducing new horizons and expertise into these organisations, as well as increasing University participation. While it is generally felt that directed fisheries research is best carried out from large fisheries institutions with their attendant expensive ship facilities, it is also realised that in general fisheries research can be expensive and that adequate funding is required for adequate quality. The areas of fisheries research particularly suited to Universities do not by and large require in any major way the provision of expensive logistic support although an improvement of existing facilities and the provision of some additional facilities are required. The areas in which Universities stand to make a significant contribution to fisheries research are as follows:-

(i) basic biology;

(ii) physiology and behaviour;

(iii) ecological principles;

(iv) inter-relations between natural and introduced species;

(v) fresh-water biology;

(vi) fish farming, methods, problems and management;

(vii) pests, parasites and diseases;

(viii) pollution;

(ix) multidisciplinary problems;

(x) population dynamics;

(xi) social interations and schooling behaviour.

Liaison between Universities and the Commonwealth and State Fisheries organisations has not been developed in the past. Many problems in the area of fisheries research would benefit greatly from increased liaison between these different bodies to their mutual benefit. Such liaison would enable the Universities to pursue topics involving sea time and provide fisheries organisations with access to University facilities and expertise.

J.W.G. LUND HONOURED

Dr. J.W.G. Lund, F.R.S., the well-known British algologist has recently been honoured by the Queen. He was awarded a C.B.E. Well done John!

* * * * *

IT'S THE SMALL THINGS THAT MATTER

"The U.S. Geological Survey's proposed budget to cover investigations of the nation's water resources during fiscal year 1976 totals $56,426,000 - an increase of $2,548,000 over FY 1975."

Source: *Update*. [Ed: the USGS know who to tap]

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KEY TO THE LARVAE OF AUSTRALIAN GENERA OF CHIRONOMINI (DIPTERA: CHIRONOMIDAE)

J. Martin

Department of Genetics, University of Melbourne

This does not include the endemic genera *Megacentron*, *Harrisius*, *Imparipecten*, *Parvitergum* or *Skusella* for which the larvae have not yet been recorded. *Microtendipes* and *Lauterborniella* are based on overseas descriptions only.

This key could be used in conjunction with an illustrated key such as Mason, W.T. - An introduction to the identification of chironomid larvae. Analytical Quality Control Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio, 2nd Edn. 1973, or Bryce, D. and Hobart, A. - The biology and identification of the larvae of Chironomidae (Diptera). Entomol. Gazette 23, 175-217 (1972).

Tribe Tanytarsini: antennal tubercles prominent, as long as wide or longer, 1st antennal segment long and curved.

Tribe Chironomini: antennal tubercles much wider than long; 1st antennal segment not long and curved 1

1. Antennae with 5 segments 2

   Antennae with 6 segments 13

2. Paralabial plates nearly touch on the midline, about 4 times wider than long ..... *Riethia*

   Paralabial plates distinctly separated 3

3. Labial plate concave with 10 low, rounded, black teeth; paralabial plates indistinct ..... *Stenochironomus*

   Labial plate not as above 4

4. Labial plate with an odd number of teeth 5

   Labial plate with an even number of teeth 11

5. Middle tooth wide and light, flanked by oblique rows of darker lateral teeth so that plate is generally concave .. *Cryptochironomus*

   Middle tooth of labial plate as dark as laterals or, if lighter, then laterals not oblique 6

6. Labial plate with 15 teeth; paralabial plate with a serrated edge ..... *Parachironomus*

   Labial plate with 11-13 teeth; middle tooth may be simple or trifid (deeply notched) appearing as 3 separate teeth 7

7. Middle tooth of labial plate completely trifid or with deep notches at its base; 11th body segment usually with 2 pairs of ventral blood gills, tubular caudo-lateral processes may be present on posterior margin of 10th body segment.. *Chironomus*

   Middle tooth simple or with lateral notches; ventral blood gills may be present, but only 1 pair, or absent 8

8. Middle tooth of labial plate with deep, posteriorly directed notches; 1 pair of ventral blood gills present 9

   Middle tooth curving evenly to apex and may have shallow, lateral notches midway up its length; epipharyngeal plate with 3 to 5 rounded teeth; 1 pair of blood gills present in *D. conjunctus* ..... *Dicrotendipes*

9. Paralabial plate with serrated edge; third antennal segment almost as long as the second segment 10

   Paralabial plate with smooth edge; third antennal segment about half as long as the second segment ..... *Xenochironomus* (appears to be subgenus *Anceus* Roback but the paralabial plates are not fused as in North American specimens).

10. 4th lateral teeth of labial plate reduced ..... *Nilodorum*

    4th lateral teeth of labial plate not reduced; feeding brush developed in epipharyngeal region of *K. martini* ..... *Kiefferulus*

11. Labial plate with a cleft median tooth raised above 1st lateral teeth, 3 most lateral teeth oblique to rest of plate, 6th lateral teeth long ..... *Cryptocladopelma*

    Labial plate not as above 12

12. Labial plate with all teeth approximately evenly graded in size; epipharyngeal teeth in three groups ... *Pentapedilum* & *Polypedilum* (in part)

    Labial plate with middle and 2nd lateral teeth nearly even in height and longer than 1st laterals; epipharyngeal teeth in three groups ..... *Polypedilum*

13. Labial plate with 12 or 14 teeth; middle pair of teeth lighter than laterals 14

    Labial plate with 16 teeth 15

14. Antennae about as long as mandibles; paralabial plates distinctly separated on midline ..... *Microtendipes*

    Antennae about twice as long as mandibles; paralabial plates meet on midline ..... *Lauterborniella*

15. Middle 2 teeth of labial plate smaller than 1st laterals, 2nd laterals small teeth on side of 3rd laterals . *Paraborniella*

    Middle 4 teeth projecting above 2nd laterals 16

16. Striations of paralabial plates indistinct ..... *Stictochironomus*

    Striations of paralabial plates visible on upper two thirds of plates ..... *Conochironomus*

CORRIGENDUM to "Key to the Genera of Australian Tanypodinae larvae" (A.S.L. Newsletter, 12(2), 12).

Replace couplet 3 with the following:

3. Antennae at least half as long as head; free chitin points or a single paralabial comb present 4

Antennae only one third as long as head; two paralabial combs present 6

LETTERS TO THE EDITOR

From a well-known Australian limnologist and leading conservationist .....

Dear Professor,

In addition to those lakes shown on the reverse side I have now sampled Lakes Aroorotamahine, Ahuksawakawa, Waiwakohokahoka, Wairarapa, Whangamomona, Kaimanawa, Raukumara and Maunzapukemotumoanarotowhanga-awamanzawai.*

Your ever obedient servant.

Albert.

*Lakes shown on reverse: Lake Waikaremoana, Lake Hayes, Lake Wakatipu, Lake Rotamahana.